

***Effects of a share-based management program  
on the Central Gulf of Alaska rockfish fishery.***

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***Abstract***

In the Spring of 2003, the U.S. Congress directed the Secretary of Commerce to establish, in consultation with the North Pacific Fishery Management Council (the Council), a pilot program for management of the Pacific Ocean perch, northern rockfish, and pelagic shelf rockfish fisheries<sup>1</sup> in the Central Gulf of Alaska (the Central Gulf). Following this directive, the Council developed a share-based management program under which the total allowable catch is apportioned as exclusive shares to cooperatives based on the catch history of the members of those cooperatives. Share-based management programs are often touted as providing participants with the ability to improve returns from the fishery. This paper examines existing fishing and production patterns and the markets served by the rockfish fisheries and the potential for the pilot program to result in changes in practices that could bring higher returns to participants.

***Introduction***

In the Spring of 2003, U.S. Congress directed the Secretary of Commerce to establish, in consultation with the North Pacific Fishery Management Council (the Council),<sup>2</sup> a two-year pilot program for management of the Pacific Ocean perch, northern rockfish, and pelagic shelf rockfish fisheries<sup>3</sup> in the Central Gulf of Alaska (the Central Gulf).<sup>4</sup> Following this directive, the Council developed a share-based management program under which the total allowable catch is apportioned as exclusive shares to cooperatives based on the catch history of the members of those cooperatives.<sup>5</sup> The program is intended to address several concerns including providing stability to both the fishing and processing sectors and to increase product value.

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<sup>1</sup> Pelagic shelf rockfish consists of dusky rockfish, yellowtail rockfish, and widow rockfish.

<sup>2</sup> Consolidated Appropriations Act of 2004. U.S. Public Law No: 108-199.

<sup>3</sup> Until 1998, the federally managed rockfish fisheries in the Central Gulf included nearshore pelagic shelf rockfish (i.e., black and blue rockfish), which are currently prosecuted exclusively in State waters. In 1998, the State took over management of the nearshore pelagic shelf rockfish fisheries. Those fisheries are not included in this program and data concerning those fisheries are not included in this paper.

<sup>4</sup> Under the Magnuson Stevens Act, eight regional councils are authorized to recommend management measures for fisheries in the US Exclusive Economic Zone (3 to 200 nautical miles off the US coast). Management measures approved by the Secretary of Commerce are administered by National Marine Fisheries Service, an agency within the Department of Commerce. Wallace and Fletcher (2000)

<sup>5</sup> This paper draws heavily on North Pacific Fishery Management Council and National Marine Fisheries Service, “Regulatory Impact Review, Environmental Assessment, and Initial Regulatory Flexibility Analysis for Amendment 68 to the Gulf of Alaska Fishery Management Plan, Central Gulf of Alaska Rockfish Demonstration Program,” June 2005. The author of this paper is a primary author of that analysis.

Examining conditions in the existing rockfish fisheries show areas of potential improvement from the program. In the current limited access fisheries, the total allowable catch is routinely harvested in just a few weeks of fishing. As expected, allocating exclusive shares will allow the harvest to be spread over much longer season, allowing participants to schedule their activities and save on costs of fishing and processing.

Some unique aspects of the rockfish fisheries and the pilot program, however, could provide added benefits. A substantial portion of the revenues in the rockfish fishery come from permissible harvest of incidental catch species (most importantly, sablefish, Pacific cod, and shortraker, rougheye, and thornyhead rockfish).<sup>6</sup> Existing management limits catch of these species to a percentage of the catch of directed rockfish. Since the incidental catch species sell for a higher price than the target rockfish, fishermen often “top off” on (or target) these species at the end of a trip. In addition, some fishermen (particularly those in the catcher vessel sector that delivers its catch to shore plants) take better care of some of the incidental catch species, particularly sablefish, which is often carried in iced totes instead of refrigerated seawater holds used for directed rockfish catch. As a result, a substantial portion of the directed rockfish catch goes to lower valued products, including, whole and headed and gutted fish and surimi.

To maintain the existing conditions in the fisheries, the program will include allocations of the valuable incidental catch species.<sup>7</sup> For all allocated species full retention will be required and allocations will be binding (requiring fishermen to stop fishing when their allocation is caught) to minimize discards. Production from incidental catch species is unlikely to change under the program. Production choices for directed rockfish, however, are likely to change somewhat. While production choices of catcher processors in the fishery are constrained by vessel size and regulatory limitations, participants in catch vessel/shore plant sector of the rockfish fisheries should be able to focus their efforts on producing higher valued, better quality products. Efforts are likely to be made to serve fresh fish markets with rockfish that could not be accessed under the existing management. The program should provide an opportunity to examine the potential for a share-based management program to address an anomaly in production choices arising out of the relative values of the different species caught in the fisheries.

### ***The current fishery***

Under its current management, the rockfish fisheries are conducted as a limited access race for fish. The trawl season opens in early July and ongoing catch is monitored by managers with closings timed to coincide with harvest of the TAC.<sup>8</sup> Participants are also subject to an aggregate limit on the amount of halibut that can be caught, all of which must be discarded as prohibited species catch (PSC). Participation records show that between approximately 5 to 7 catcher processors and approximately 30 and 35 catcher vessels participated in the fisheries annually in recent years. Although entry is limited under a license program, those limits are not constraining

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<sup>6</sup> Sablefish are commonly referred to as black cod; thornyhead rockfish are frequently referred to as idiot fish.

<sup>7</sup> To avoid premature closures, Pacific cod will not be allocated to catcher processors and shortraker and rougheye rockfish will not be allocated to the catcher vessel sector. Estimated allocations of these species for the respective sectors were believed to be potentially inadequate to support catch of directed rockfish. Instead, catch of these species by the applicable sector will be limited to a percentage of the catch of directed rockfish (as under existing management).

<sup>8</sup> The fisheries open to non-trawl participants on January 1<sup>st</sup>. Non-trawl participants, however, have historically harvested a very small portion of the Central Gulf rockfish TAC (i.e., less than 1 percent). To accommodate growth of this sector, the program would allocate 2.5 percent of the aggregate TAC of rockfish to fixed gear vessels. Since this sector has limited participation in the fisheries the remainder of this paper is focused on practices of the trawl gear participants.

as approximately half of the eligible catcher processors and less than one-third of the eligible catcher vessels typically participate in the fisheries. Table 1 summarizes the openings and closings in the Central Gulf rockfish fisheries from 1996 to 2003.

**Table 1. Openings and closures in the Central Gulf of Alaska rockfish fisheries (1996-2003).**

Year	Opening for species	Opening date	Closures			Reason
			Pacific Ocean Perch	Northern Rockfish	Pelagic Shelf Rockfish	
1996	all	July 1	July 11	July 20	none	TAC (POP, Nor)
1997	all	July 1	July 7	July 10	July 15	TAC
1998	all	July 1	July 6	July 14	July 19	TAC
1998 reopen	POP	July 12	July 14	---	---	TAC
1999	all	July 4	July 11	July 19	---	TAC(POP, Nor)
1999 reopen	POP, Nor	August 6	August 8	August 10	---	TAC(POP, Nor)
1999 closure	PSR	July 4	---	---	September 3	PSC
2000	all	July 4	July 15	July 26	July 26	TAC(POP, Nor)/PSC(PSR)
2001	all	July 1	July 12	July 23	July 23	TAC(POP)/PSC(Nor, PSR)
2001 reopen	Nor, PSR	October 1	n/a	October 21	October 21	PSC
2002	all	June 30	July 8	July 21	July 21	TAC
2003	all	June 29	July 8	July 31	July 29	TAC

TAC - Total Allowable Catch

POP - Pacific Ocean perch

Nor - Northern rockfish

Source: NOAA fisheries status reports and groundfish closure summaries

PSC - Prohibited Species Catch

PSR - Pelagic Shelf rockfish

The closings show that all harvests are usually made in a few weeks each year. A general progression of targeting is also apparent, as most participants target Pacific Ocean perch first, until the TAC of that species is fully harvested, after which most vessels move on to the northern rockfish or pelagic shelf rockfish directed fisheries, while others move on to other fisheries in and outside of the Central Gulf. Typically, closures have resulted from the harvest of the rockfish TACs, although at times limits on catch of PSC, usually halibut, have closed the fisheries.<sup>9</sup>

The short season has also contributed to spatial concentration of catch in fishery (see Figure 1).<sup>10</sup> Catcher vessels make most harvests close to port because of the need to offload harvests and return to the fishing grounds to maximize total catch. In addition, processors have demanded that fishermen limit trips to less than 72 hours as a means of ensuring quality of catch. The limitation on fishing trip time effectively limits the spatial distribution of catch for catcher vessels. Since Kodiak processors process the great majority of catch from the rockfish fisheries, catch of the catcher vessel sector is concentrated in the grounds near Kodiak. While catcher processors are also subject to the time limitation of the season, since they process their catch on board, their fishing activity is not spatially limited in the same manner as catcher vessel harvests.

<sup>9</sup> For example, in 2000, halibut PSC closed the pelagic shelf rockfish fishery. In 2001, halibut PSC closed both the northern rockfish and pelagic shelf rockfish fisheries in July. The fisheries were reopened on October 1<sup>st</sup>, when the fourth quarter halibut allocation came available. The fisheries closed again near the end of October after harvest of the halibut PSC allocation.

<sup>10</sup> Although some fishermen target rockfish with pelagic trawls, most rockfish are harvested with non-pelagic trawls.

**Figure 1. Observed rockfish non-pelagic (bottom) trawl effort (hauls/25 square kilometers) - 1990-2002.**

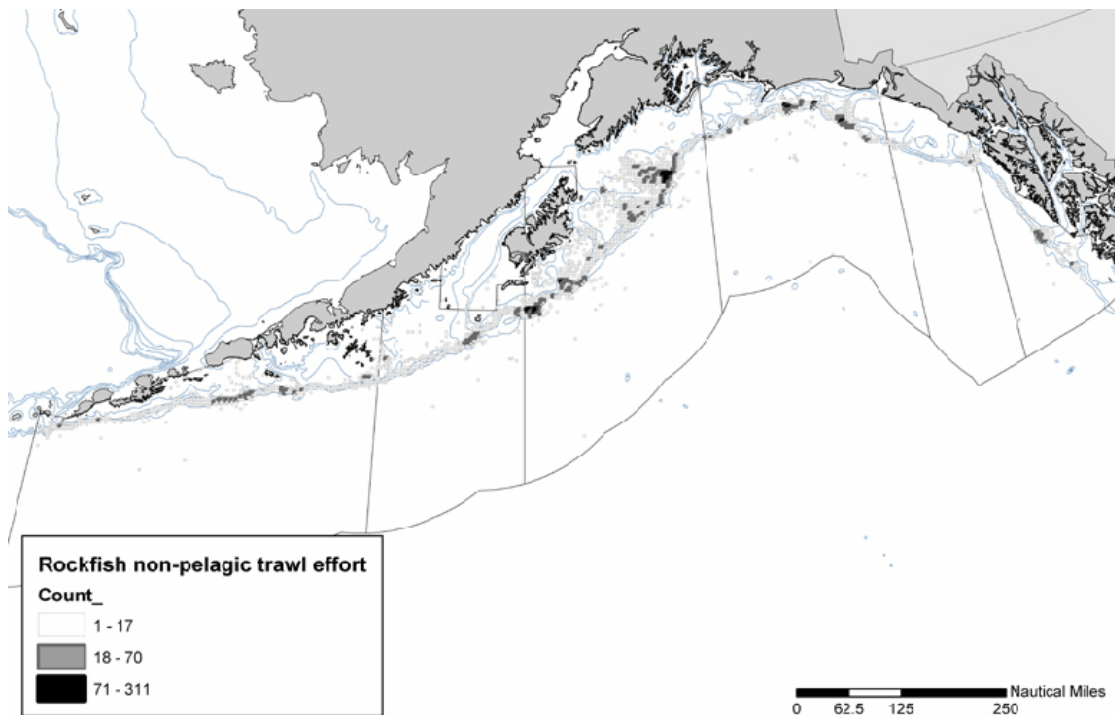
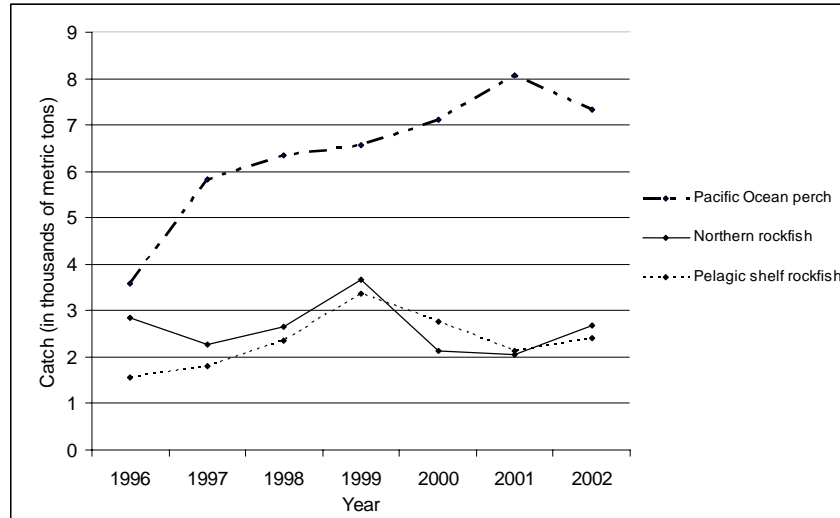


Figure 2 shows the catch from the CGOA rockfish fisheries from 1996 to 2002 in thousands of metric tons. The figure shows that catch of Pacific Ocean perch as dominated the rockfish fisheries in recent years, with harvests over 6 thousand metric tons in the last 6 years of the period considered. Combined catches of northern rockfish and pelagic shelf rockfish fluctuated with the lowest catch approximately 4 thousand metric tons and the largest catch approximately 6.5 thousand metric tons.

**Figure 2. Catch of Central Gulf of Alaska rockfish in thousands of metric tons (1996-2002).**



Participants catch a variety of other species during the directed CGOA rockfish fishery, the most important of which are Pacific cod, sablefish, thornyhead rockfish, shortraker rockfish, and rougheye rockfish. Table 2 shows catch rates of these species in observed tows targeting rockfish.<sup>11</sup> The table also shows the rate of catch of these incidental catch species in rockfish tows of various percentiles of observed tows. For example, the table shows that 50 percent of the rockfish target tows had no observed Pacific cod. In the tow that is at the 75<sup>th</sup> percentile of rate of Pacific cod catch, Pacific cod was 3.2 percent of the target rockfish catch (or for each pound of rockfish approximately .032 pounds of Pacific cod was caught). The table shows that for each of these incidental catch species, none of the species was observed in 50 percent of the tows.

These incidental catch species are currently managed under “bycatch status” with a maximum retainable allowance (MRA), which limits retention of these species to a percent of the retained target harvest. Table 3 and Table 4 show catch of these species relative to target rockfish catch and the applicable MRAs for the catcher processor and catcher vessel sectors, respectively. Comparing the incidental catch rates from observed rockfish targeted tows and the catch rate in the fishery suggests that participants in the rockfish often “topping off” on these valuable incidental catch species.<sup>12</sup> Catch of these species is likely limited because of the race for the target rockfish as participants try to strike a balance of time harvesting target rockfish and valuable secondary species in an attempt to maximize their total revenues. Overall, incidental catch of Pacific cod and sablefish in the rockfish fishery are approximately 2.5 and 10 percent of the respective TACs of those species in the Central Gulf of Alaska. Incidental catch of thornyheads by the rockfish fisheries during the qualifying years was approximately 25 percent of the Central Gulf total catch, while incidental catch of shortraker/rougheye (under a combined TAC) was over half of the total harvest from the Central Gulf.

<sup>11</sup> Shortraker and rougheye were managed under a combined TAC until 2005. As a consequence, some of the data collected concerning these species fails to distinguish the two species.

<sup>12</sup> A study of “natural” bycatch rates (the rate at which bycatch occurs in targeted trawl tows in a fishery) by Ackley and Heifetz (2001) concluded that participants in the Central Gulf of Alaska directed rockfish fisheries target sablefish to the extent permitted by MRAs.

**Table 2. Incidental catch rates of various species in observed Central Gulf of Alaska hauls targeting rockfish (1996-2003).**

Incidental catch species	Trawl hauls with Central Gulf rockfish targets	Hauls with bycatch species	Weight of catch of species	Incidental catch as percent of target rockfish	Incidental catch species as a percent of targeted rockfish in the					
					25th percentile	50th percentile	75th percentile	85th percentile	95th percentile	100th percentile
CGOA rockfish	2756	2756	41,519,208	100	100	100	100	100	100	100
Pacific Cod	2756	1364	742,872	1.79	0	0	3.23	6.40	17.12	98.55
Sablefish	2756	1102	1,123,400	2.71	0	0	2.84	8.27	27.07	95.48
Thornyhead	2756	638	309,699	0.75	0	0	0	0.66	5.21	87.70
Shortraker	2756	232	337,940	0.81	0	0	0	0	2.59	92.53
Rougheye	2756	371	389,981	0.94	0	0	0	0	3.13	88.11
Shortraker/Rougheye <sup>(1)</sup>	2756	14	33,008	0.08	0	0	0	0	0	16.80

Source: 1996-2003 GOA Observer data, with data calculations by NPFMC.

Central Gulf rockfish includes Pacific Ocean perch, northern rockfish and pelagic shelf rockfish.

(1) where shortraker rockfish and rougheye rockfish were combined in the observer data

**Table 3. Catcher processor production, product revenues, average prices, maximum retainable allowance, and percent of target rockfish (1996-2002).**

Species	Product	Number of vessels	Maximum Retainable Allowance	Percent of target rockfish catch	Product weight (MT)	Product revenues (\$)	Average product price (\$)
Pacific Ocean perch	whole	7	-	-	1,817.9	1,476,859	0.368
	western cut	2	-	-	*	*	*
	eastern cut	20	-	-	10,663.4	11,964,004	0.509
Northern rockfish	whole	7	-	-	2,004.4	1,227,760	0.278
	western cut	1	-	-	*	*	*
	eastern cut	18	-	-	2,913.0	2,121,563	0.330
Pelagic shelf rockfish	whole	4	-	-	434.3	399,409	0.417
	western cut	1	-	-	*	*	*
	eastern cut	18	-	-	4,310.9	4,469,553	0.470
Pacific cod		18	20	1.4	306.7	706,072	1.044
Sablefish		21	7	4.7	1,239.5	9,701,981	3.550
Shortraker/rougheye		19	15**	6.5	1,340.0	4,182,038	1.416
Thornyheads		21	15**	1.6	555.8	1,858,292	1.517

\* Withheld for confidentiality.

\*\* Retainable percentage is combined limit on shortraker/rougheye and thornyheads.

Source: NPFMC Rockfish Database, Version 1.

**Table 4. Catcher vessel landings, average ex vessel prices, maximum retainable allowance, and percent of target rockfish (1996-2002).**

Species	Number of vessels	Maximum Retainable Allowance	Percent of target rockfish catch	Landings (mt)	Ex vessel gross revenues (\$)	Average ex vessel price (\$/lb)
Pacific Ocean perch	50	-	-	21,350.0	2,810,255	0.060
Northern rockfish	49	-	-	10,270.1	1,301,287	0.057
Pelagic shelf rockfish	49	-	-	7,181.3	932,095	0.059
Pacific cod	47	20	11.1	4,293.9	2,499,464	0.264
Sablefish	49	7	6.3	2,455.6	8,175,541	1.510
Shortraker/rougheye	46	15*	0.6	231.9	60,677	0.119
Thornyhead	49	15*	0.7	290.7	309,481	0.483

\* Retainable percentage is combined limit on shortraker/rougheye and thornyheads.

Source: NPFMC Rockfish Database, Version 1

Table 3 and Table 4 also show revenues of target rockfish and the incidental catch species harvested in the rockfish fisheries for the two sectors. The tables show that rockfish participants gain substantial revenues from these incidental catch species. For the catcher processor sector (Table 3), all target rockfish production is whole and head and gut fish. Most, if not all, of this production is delivered to Asia, where the whole fish is typically consumed and the head and gut is generally reprocessed. A portion of the head and gut production is returned to U.S. markets. Most vessels in the fishery have no (or limited) ability to produce more processed outputs. The modification to many of these vessels that would be necessary for the production of more processed products (such as fillets) would be cost prohibitive because of vessel structure and regulatory limitations. The table shows that average product prices of the incidental catch species are all more than double the average product price of the different target rockfish products, while sablefish product prices averaging seven times the highest rockfish product price. In general, catcher processor production is of high quality, as fish are processed onboard soon after they are caught. Trawl catcher processors, however, must harvest and process fish rapidly to maintain quality and accommodate additional catch.

Table 4 shows catch and revenues of catcher vessels in the rockfish fisheries from both rockfish and important incidental catch species. The table shows that catcher vessels also receive substantial revenues from incidental catch species, with revenues from sablefish exceeding those from all three target rockfish species combined and Pacific cod revenues larger than revenues from northern rockfish and pelagic shelf rockfish combined, but slightly less than revenues from Pacific Ocean perch. Ex vessel prices are negotiated informally by the rockfish fleet in the preseason. Fishermen often contact processors in the preseason to inquire about pricing for the season and delivery scheduling. A processor typically offers a common price to all of its fleet members. Fishermen often communicate with each other concerning processor price offers, but most perceive that little negotiating leverage exists.<sup>13</sup> Usually fishermen will remain with their primary processor throughout the season delivering on a rotation, with fishing trips of less than 72 hours, to maintain product quality. Fishermen typically do not receive payment for low quality fish that cannot be marketed (except as meal). At times, fishermen will move to another processor for a delivery midseason. These movements are typically made to avoid loss of quality because of a wait to offload, and at times are facilitated by the processors. Occasionally, post season bonuses are paid by processors in response to good market prices for products or prices of competing processors.

<sup>13</sup> In the last few years, a new processor has entered the market and reportedly has offered a slightly higher price than all other processors. The new entrant has drawn some vessels away from other processors, but most of the fishermen have remained with their historic processor.

Incidental catch species (particularly Pacific cod and sablefish) are an important part of pricing in the rockfish fisheries. Fishermen typically inquire of the price of these species with processors in the preseason. Prices of Pacific cod are typically based on the directed season price from earlier in the year, with a possible downward adjustment for the absence of milt and roe and the lower quality observed in the summer months. Sablefish prices are based on prices in the IFQ fishery, with some downward adjustment for lower quality in the trawl fishery. Fishermen typically separate incidental catch species from target rockfish. In particular, sablefish is often stored in iced totes to maintain quality.

Quality of target rockfish is difficult to maintain because of the race to harvest. Harvesters that try to maximize catch on a tow are likely to stuff their nets, which can reduce fish quality. In addition, rockfish are relatively difficult to handle because of their scales and spines and bloating that occurs from their air bladders exploding when they brought to the surface quickly. Pacific cod are usually bled. Sablefish are usually bled and sometimes are headed and gutted. Both species bring a substantially higher price than the target rockfish and are priced based on quality, so fishermen give extra attention to their care. Shortraker, roughey, and thornyheads also bring a premium price, but are caught in substantially lower quantities than Pacific cod and sablefish and therefore receive less attention.

Once landed, shore-based processors make a variety of products from target rockfish landings. Table 5 shows production, revenues, and average prices from target rockfish species by product type at plants with substantial landings from the Central Gulf.<sup>14</sup> The table shows that most of the catch is processed into whole and head and gut products, which sell for substantially less than fillets. A portion of the catch is processed into surimi, some portions of which cannot be revealed because of confidentiality restrictions. Accepting that whole and head and gut products have substantially higher recovery rates, the return per pound of raw fish from fillet production is substantially higher than that for whole and head and gut products.<sup>15</sup> The relatively high price for pelagic shelf rockfish is likely because of the contribution of the non-trawl fleet, which has some substantial catch of the nearshore pelagic shelf rockfish species that are not included in this program.

**Table 5. Production, revenues, and average prices of rockfish by shore based processors in the Central Gulf of Alaska rockfish fishery (1996-2002).**

Species	Fillets				Surimi				Whole and head & gut			
	Number of processors	Pounds of product	First wholesale revenues (\$)	Average price (\$/lb)	Number of processors	Pounds of product	First wholesale revenues (\$)	Average price	Number of processors	Pounds of product	First wholesale revenues (\$)	Average price (\$/lb)
Pacific Ocean perch	8	4,997,971	7,823,210	1.565	4	3,525,587	2,310,370	0.655	10	7,670,954	2,437,360	0.318
Northern rockfish	7	2,049,212	3,132,966	1.529	2	*	*	*	7	3,184,011	920,369	0.289
Pelagic shelf rockfish	10	1,533,828	2,301,611	1.501	1	*	*	*	13	2,684,097	2,012,966	0.750

\* Withheld for confidentiality.

Source: Commercial Operators Annual Reports

<sup>14</sup> This production data includes any catch of these target rockfish at these plants, as production data for exclusively Central Gulf target rockfish are not available.

<sup>15</sup> Recovery rates are generally approximately 25 percent for fillets, 20 percent for surimi, and 55 percent for head and gut products.



### ***Pilot program management***

The pilot program will establish two related management programs for the two sectors participating in the rockfish fisheries (i.e., the catcher vessel sector and the catcher processor sector). The TAC of the target rockfish species are split between the two sectors based on their respective historic catch.<sup>16</sup> In addition, each sector is allocated incidental catch species (Pacific cod, sablefish, shortraker, rougheye, and thornyhead) based on the historic harvests of sector members and halibut PSC based on historic catch of halibut in the target rockfish fisheries.<sup>17</sup> Participants in each sector could either fish as part of a cooperative, which would receive allocations of target rockfish, incidental catch species, and halibut PSC from the sector's allocation based on the catch histories of its members, or fish in a limited access, competitive fishery, which would receive an allocation based on the history of non-members of cooperatives.<sup>18</sup> Cooperatives are intended to manage and coordinate fishing of their member's allocations. To minimize discards, target rockfish and allocated incidental catch species would be subject to a full retention requirement. All allocations to a cooperative would be constraining, so a cooperative will need to monitor and coordinate manage its catch of target rockfish, incidental catch species, and halibut PSC (which must be discarded) to ensure that it is able to fully harvest its allocation of retainable species. To protect processors, each catcher vessel would be eligible for a single cooperative that would be associated with the processor that it delivered the most rockfish to historically.<sup>19</sup> Although not specified in the Council motion, this association is intended to ensure that a cooperative lands a substantial portion of its catch with the associated processor. The exact terms of the association will be subject to negotiation, but since the cooperative agreement requires the approval of the associated processor, it will likely bind the cooperative to land a substantial portion of its catch with the processor.

The fishing season for cooperatives would be extended substantially beyond the current season, opening on the 1<sup>st</sup> of May and extending until the 15<sup>th</sup> of November.<sup>20</sup> The limited access fishery would open in the beginning of July and would close when its participants have fully harvested the allocation in that fishery. The limited access fishery would be managed under rules similar to the current fishery, but MRAs for incidental catch species (shortraker, rougheye, thornyhead, and sablefish) would be reduced from current levels to maintain catch levels below the allocated amount.

### ***Fishing practices under the pilot program***

Historic harvests of Central Gulf rockfish are used to make allocations, under the pilot program alternatives, so distribution of Central Gulf rockfish allocations both to and within the different

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<sup>16</sup> Two set asides will be made prior to splitting the rockfish TAC between the sectors. The first is intended to support incidental catch of rockfish in other fisheries; the second is intended to support a small entry level fishery for persons not eligible for the program.

<sup>17</sup> To ensure that adequate allocations are available to support catch of target rockfish, the Pacific cod will be managed under an MRA for the catcher processor sector and shortraker and rougheye rockfish will be managed under MRA for the catcher vessel sector.

<sup>18</sup> Within the sector allocations of incidental catch species and halibut PSC would be based on historic catch of target rockfish.

<sup>19</sup> Although many observers may view this limitation as overly restrictive, the Council believed that the provision was acceptable, given that the program is intended to have a maximum term of two years and no participants in the fishery voiced their opinion against the provision.

<sup>20</sup> The May 1st opening date of the fishery could result in some harvests in the fishery prior to completion of rockfish larvae release (parturition). The exploitation rates for rockfish in the Gulf of Alaska are conservative, largely due to the lack of definitive biological information on many of the species. It is not likely that allowing the fishery to occur prior to larvae release would create a biological concern. (see Lunsford (1999) for a summary of studies of parturition for Pacific Ocean perch.)

sectors will be similar to the historic distribution of harvests during the qualifying years. The number of persons receiving allocations is approximately twice the average annual participation in the catcher processor fleet, and approximately 50 percent greater than the average annual participation in the catcher vessel fleet, showing that some participants have moved in and out of the fisheries over time.

Generally, persons eligible for the program can be expected to fish in the cooperative fishery, where slowing of fishing will create an opportunity to increase revenues and decrease costs.<sup>21</sup> Within each cooperative, it may be anticipated that each member would receive revenues based on the catch history (or allocation) that the person brings to the cooperative, with participants that fish shares of others receiving additional compensation for their fishing effort. Fishing within a cooperative could be far more concentrated than the underlying allocations. To save on observer coverage and operational costs, it is likely that most cooperatives will consolidate harvests to some extent, removing some vessels from the rockfish fisheries. Since the rockfish fishery is a relatively small part of the fishing these vessels are used for, few vessels are likely to be retired altogether. Instead, vessels will be used in other fisheries (to the extent permitted by limitations intended to protect participants in those other fisheries) or idled, possibly for maintenance, during the traditional rockfish season.

The two most pronounced differences in fishing practices that are likely under the pilot program are the spatial and temporal distribution of catch. Because the programs allocate cooperative fishing privileges, which may be fished during an extended season, participants in the program are likely to slow their rate of harvest and distribute that harvest over greater time and a larger area. Changes in activities across the two sectors are likely to differ somewhat because of operational requirements. Catcher vessels have typically been limited in the range of fishing activity by processor demands related to the quality of landings. Typical rockfish fishing trips last less than 72 hours. As participants in the pilot program alternatives strive to improve quality of landings, it is possible that fishing trip lengths could shorten. As a result, catcher vessel fishing is still likely to be concentrated in areas that are in relatively close proximity to Kodiak, where all of the qualified processors are located. Catcher processors, on the other hand, are not constrained by shore-based processing, and may distribute their catch over larger areas of the grounds. The extent of this distribution of catch could be limited, if catcher processors perceive a cost reduction benefit to concentrating catch in one area. If catch is consolidated on a few catcher processors, concentration of landings temporally is more likely.

Both sectors should distribute catch over extended time periods, as the longer season allows. The extent to which catch is temporally distributed depends on potential revenues, operational needs of participants, and catch rates. Catch may also be distributed throughout the season (by catcher

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<sup>21</sup> Although some catcher vessels may not join cooperatives because of a relatively poor negotiating position under the program applied to them, in general their opportunity in a cooperative is likely better than their opportunity outside of a cooperative leading most into the cooperative fishery. Each catcher vessel will be eligible for only one cooperative, which must associate with a particular processor. Given the processor involvement, it is likely that each cooperative will have limited latitude to pursue markets for their landings beyond the single associated processor. This limitation could discourage some catcher vessels from joining the cooperative fishery, if cooperative agreement or price offer from the processor is viewed as unfair. Cooperative membership, however, is likely to be favored by most participants in the program because of the relatively poor opportunity in the limited access fishery, which is subject to a race for fish with reduced MRAs for the valuable incidental catch species, which are intended to maintain historic catch rates of those species.

vessels particularly) to attempt to develop markets for fresh fish.<sup>22</sup> Catcher processors may have less incentive to fish outside of the summer months than catcher vessels, as most produce only frozen head and gut and whole products and are less likely to attempt to serve fresh fish markets that are more accessible to the shore-based fleet. Operationally, most participants are likely to schedule fishing to avoid conflicts with their participation in other fisheries. At a minimum, one would expect substantial fishing to occur prior to or after the traditional July season to allow participants to fish in other July fisheries.<sup>23</sup> Other market demands and scheduling preferences are likely to arise, but depend on individual circumstances or cannot be predicted.

Catch rates could also influence the temporal distribution of fishing. Low catch rates of rockfish or high catch rates of incidental catch species or halibut could also lead a cooperative to change its timing of rockfish targeting. Some longtime participants in the fishery suggest that rockfish aggregations are at their greatest in the summer months. If participants observe relatively high rockfish aggregations (and catch rates) in summer months, it is likely that their harvests will be concentrated in the summer regardless of the extended season. Bycatch considerations could also affect the temporal distribution of fishing effort. Participating fishermen will be strictly limited by allocations of the three rockfish species, allocated incidental species, and halibut PSC. All of the allocations are based on historic catch that occurred in the traditional July season. Attempting to fully harvest all of these allocations could be challenging, if catch composition changes substantially outside of the traditional July season. One reason that the current opening is scheduled for early July is to avoid halibut bycatch. The extent to which participants will be able to harvest rockfish at other times and avoid halibut cannot be predicted. If participants find that halibut bycatch is relatively high outside of the traditional season, they are likely to restrict their fishing to times when halibut bycatch rates are low. Some participants have suggested that they intend to experiment with pelagic gear and other gear modifications in an attempt to reduce halibut bycatch. If successful, these changes in effort could allow for greater distribution of catch across the extended season.

Although the program is intended to rationalize the rockfish fishery, it is important to recognize the value of secondary species harvests. Historically, all of the secondary species have generated more revenues per pound for participants than the target rockfish. All of the pilot program alternatives permit persons to harvest secondary species allocations independent of the harvest of rockfish allocations. Given the value of the secondary species allocations and the harvest flexibility, participants can be expected to harvest their entire allocations of secondary species. Depending on incidental catch rates, it is likely that some cooperatives will choose to reserve a portion of the allocation of each secondary species until their target rockfish is harvested, after which all remaining secondary species allocations would be harvested.

### ***Production from the fisheries under the pilot program***

The effects of the pilot program on products from the fisheries are likely to vary across the two sectors. Processing by catcher processors under the catcher processor pilot program alternative is likely to remain similar the current processing by that sector. Most vessels in the sector are

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<sup>22</sup> One of the primary benefits of introduction of an individual vessel quota in British Columbia halibut fishery and an IFQ program in Alaska's halibut fishery was the development of fresh markets for catch from those fisheries (see, Casey, Dewees, Turriss, and Wilen (1995) and . While a similar outcome could occur in the rockfish fisheries, development of fresh rockfish products could be more challenging, as most processing occurs in Kodiak, which is less accessible than most ports that produce fresh halibut.

<sup>23</sup> "Sideboard" limitations are incorporated into the program to prevent participants from increasing effort beyond their historic levels in fisheries other than the Central Gulf rockfish fisheries. These sideboards are intended to protect historic participants in those other fisheries, but will not prevent participants in the rockfish pilot program from maintaining their positions in those other fisheries.

equipped for producing a few simple products (frozen whole and head and gut fish). Because of vessel size and regulatory limitations, few of these vessels are likely to change plant configurations to process higher-valued, more processed products. Quality could improve some under the new program, as vessels are under less pressure to harvest fish rapidly to protect their share of the fishery. Instead, participants may slow their rate of harvest to reduce the time between when catch is brought on board and when that catch is processed. The distribution of products is also likely to remain similar to its current distribution, with any changes arising from changes in consumer demands or changes in costs of secondary production.

Processing of shore-based plants under the pilot program can be expected to change substantially, through several related factors. Catcher vessel cooperatives provide a structure for coordination of harvest activity. Catcher vessels can use the cooperative structure to time landings to accommodate processing schedules and market demands, spreading landings over the longer season. While processing employment during the season peak may decline, employment should be more stable with the scheduling of landings. Timing of landings could also be critical to maintaining quality, as product quality can decline if fish remain in the hold for extended periods of time.<sup>24</sup> Distribution of landings over a longer period should also contribute to improved quality of production, as processors are under less pressure to process large quantities in a short period of time to secure market share. A larger portion of the catch should be processed into fillets, rather than whole and head and gut products or surimi. Timing of landings could also be important to processors that attempt to serve time sensitive markets. Processors participating in the program have expressed an interest in serving fresh markets in the U.S. that are experiencing a decline in rockfish because of restrictions on fisheries off the west coast of the contiguous U.S. Timing of landings will be critical to serving those fresh markets. These changes in landings should allow processing to evolve to serve higher value and higher quality markets

It is possible that some differences in processing could arise across processors. While some product differentiation and pursuit of different markets can benefit both consumers and producers, some of the effect in this case could arise from the program structure, which may not compel some processors to aggressively pursue market opportunities. Since catcher vessels are eligible for a single cooperative associated with a specific processor, processors are unlikely to compete for landings on a regular basis, but only at the time of the cooperative formation, which the processor must approve. This limit on the competition for landings from the fishery could reduce competition among processors in markets for their outputs.<sup>25</sup> While some processors may pursue any available markets, it is possible that others will show less interest in extracting maximum revenues from rockfish landings, particularly if their processing of those landings could interfere with their operations in other fisheries. So, while processing should expand to higher value and higher quality products, it is possible that some processors may be less aggressive in challenging high revenue markets.

## **Conclusion**

In recent years, limited license management of the Central Gulf rockfish fisheries has resulted in a race for fish. The race is evident as the TAC is usually caught in the fishery over a few weeks by license holders competing for a share of the catch. Some predictable (and typical) effects of this management are that participants' costs of harvesting and processing are increased as effort

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<sup>24</sup> Most participants may be expected to choose to sacrifice some cost efficiencies (i.e., use more inputs such as fuel) to improve quality of deliveries and time those deliveries for specific markets. This trade off may increase costs, but should result in improvements in returns from the fisheries.

<sup>25</sup> The less restrictive system of cooperative/processor associations created in the Bering Sea pollock fishery was criticized by Anderson (2002) for its potential to decrease efficiency.

choices that increase catch and processing rates increase revenues in the fishery. Quality and value of products from the fishery also suffer (less so in the catcher processor sector where catch is typically processed shortly after it is brought onboard). In addition to these expected effects, a few less predictable effects are present. Participants in the rockfish fisheries have typically derived a substantial share of their revenues from the harvest of valuable incidental catch species (most frequently sablefish, Pacific cod, and shortraker, rougheye and thornyhead rockfish). The current management limits retention of these species to a percentage of the target catch. In response, rockfish fishermen focus rockfish efforts on increasing quantities of catch, while maintaining minimum quality standards for that catch, and “top off” on harvests of the permitted incidental catch species, which are usually subject to greater care in handling to maintain higher quality.

In an effort to improve the management of the fishery, Congress directed the Secretary of Commerce, in consultation with the North Pacific Fishery Management Council (the Council), to develop a pilot management program that credits historic harvesting and processing in the fishery. The Council developed a program that will allocate the catch to fishing cooperatives. These exclusive allocations, together with an extended 6½ month season, will allow participants to refocus their efforts to maximize returns from the fishery, by making production choices that improve revenues and minimize harvest and processing costs. Allocations of directed rockfish and most of the valuable incidental catch species are included in the program. Full retention of allocated species is required with all allocations binding to reduce discards. For catcher processors, most improvement will be in reducing costs of catching and processing fish. Most vessels in the sector produce relatively high quality products and are limited by vessel and regulatory constraints from changing product forms. The catcher vessel/inshore processing sector, however, should have opportunities to change product forms while minimize harvest and production cost. While some improvements in production from incidental catch species are possible, a large change can be expected in production of target rockfish species. Some participants have expressed interest in providing target rockfish to fresh fillet markets, previously inaccessible because of the short season and relatively unreliable quality. The program should provide additional experience and information to both regulators and participants in the fishing and processing sectors concerning the potential improvements in returns from fisheries under share-based management.

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